DRI OCT TRITON™ CLINICAL COMPENDIUM

Summary of peer-reviewed clinical research

TOPCON Healthcare

PREFACE

At Topcon Healthcare, our vision is to empower providers and harmonize workflow with smart and efficient diagnostic technologies for enhanced patient care.

As an established global leader in ophthalmic imaging technology, we offer clinicians the tools to see deeper and locate abnormalities with greater efficiency and clarity. Our current OCT Fundus Camera portfolio is evidence of our commitment to innovation in pursuit of this vision.

The Triton™ was one of the first devices in the world to offer swept-source OCT technology and has since been used in clinics and research institutions worldwide.

This clinical compendium is an introduction to the range of research on and utilization of the Triton. In addition to exploring this collection of peer-reviewed clinical articles, we encourage you to learn more at www.topconhealthcare.com.

Summarized articles are outlined below, and other relevant texts are included in the bibliography.

NOTE: **Not all products and features listed in this clinical compendium are available in all markets**. Contact your local Topcon Healthcare representative to see product availability in your region.

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35 **Sub-clinical thickening of the fovea in diabetes and its relationship to glycaemic control: a study using swept-source optical coherence tomography**
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Graefe's Archive for Clinical and Experimental Ophthalmology (2021) 259: 633-641.
DOI: 10.1007/s00417-020-04914-2

36 **Optical Coherence Tomography Predictors of Favorable Functional Response in Naïve Diabetic Macular Edema Eyes Treated with Dexamethasone Implants as a Grist-Line Agent**
Meduri A, Oliverio GW, Trombetta L, Giordano M, Inferrera L, Trombetta CJJ.
Ophthal 2021; Article ID 6639418, 5 pages. DOI: 10.1155/2021/6639418

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41 **Faricimab in neovascular AMD: first report of real-world outcomes in an independent retina clinic**
Stanga PE, Valentin-Bravo FJ, Stanga SEF, Reinstein UI, Pastor-Idoate S, Downes SM.
Eye(2023) 37:3282-3289; PMID: 36959312 DOI: 10.1038/s41433-023-02505-z

44 MACULAR DISORDERS

45 **Macular Ganglion Cell Complex and Peripapillary Retinal Nerve Fiber Layer Thicknesses in Hydroxychloroquine Retinopathy**
Kim KE, Kim YH, Kim J, Ahn SJ.
Am J Ophthalmol. 2023 Jan;245:70-80. Epub 2022 Aug 11. PMID: 35963445
DOI: 10.1016/j.ajo.2022.07.028

46 **Topographic patterns of retinal edema in eyes with branch retinal vein occlusion and their association with macular edema recurrence**
Park HM, Kim YH, Lee BR, Ahn SJ.
Sci Rep 11, 23249 (2021). DOI: 10.1038/s41598-021-02726-w

49 CHOROIDAL DISORDERS

50 **Choroidal Thickness in Thyroid Eye Disease: Comparison With Controls and Application in Diagnosing Non-Inflammatory Active Disease**
Dave TV, Natarajan R, Reddy RU, Kapoor AG, Dave VP
Cureus 13(11): e19779. DOI: 10.7759/cureus.19779

ANALYSIS AND IMAGE QUALITY

Peer-Reviewed Publications

A systematic prospective comparison of fluid volume evaluation across optical coherence tomography devices used in clinical practice

AUTHORS: Kostolna K, Reiter G S, Frank S, Coulibaly L M, Fuchs P, Roggla V, Gumpinger M, Leitner Barrios G P, Vares V, Bogunovic H, Schmidt-Erfurth U.

PUBLICATION: Ophthalmology Science (2024), DOI: 10.1016/j.xops.2023.100456

*GSR, HB, and USE received financial support from RetInSight GmbH.

STUDY PURPOSE

To provide a comparison of qualitative and quantitative differences between OCT devices in a systematic manner.

OVERVIEW

STUDY DESIGN

Observational, cross-sectional study

STUDY DEVICE(S)

- SD-OCT Spectralis® Heidleberg HRA +OCT (Heidelberg Engineering GmbH; Heidelberg, Germany)
- SD-OCT Cirrus® HD-OCT (Cirrus, Carl Zeiss Meditec, Dublin, CA)
- SD-OCT 3D OCT – 1 Maestro™2 (Topcon, Tokyo, Japan)
- SS-OCT DRI OCT Triton™ DRI OCT (Topcon, Tokyo, Japan)

OF EYES/PATIENTS

- 40 eyes from 40 patients with nAMD

OUTCOME MEASURES

- Total fluid volume (TFV) in nL of intraretinal fluid (IRF), subretinal fluid (SRF), pigment epithelial detachment (PED) in the central 1 mm and 6 mm.

RESULTS

- Qualitative difference fluid volume: The B-scans from different devices vary in their signal-to-noise ratio, axial resolution, reflectivity, and contrast.
- In the central 1 mm, IRF, SRF, and PED volume measurements achieved excellent reliability between all four devices with an ICC of 0.988 (CI 0.980-0.993), 0.996 (CI 0.993 – 0.998) and 0.998 (CI 0.996–0.999), respectively. In the central 6 mm, IRF, SRF and PED volume also showed excellent reliability between all four devices with an ICC of 0.939 (CI 0.900 -0.965), 0.996 (CI 0.994-0.998) and 0.997 (CI 0.996 - 0.999), respectively.
- Wider 6 mm area: There was a trend towards higher IRF volume measurements in Spectralis compared to Maestro, Cirrus, and Triton. The highest difference of means was calculated between Maestro and Spectralis (-20 nL, SD ± 51 nL), followed by Cirrus and Spectralis (-17 nL, SD ± 33 nL) and Triton and Spectralis (-15 nL, SD ± 40 nL). For SRF, there was no trend or bias in any of the pairwise comparisons, while PED volume showed high differences in all pairwise comparisons with a trend towards higher volume measurements in Spectralis compared to the three other devices.

CONCLUSIONS

- Fluid volume is quantifiable and comparable between Spectralis, Cirrus, and two Topcon OCTs (SD-OCT 3D OCT – 1 Maestro™2 and SS-OCT DRI OCT Triton™ DRI OCT) with excellent reliability with ICC values above 0.94 for all fluid compartments in the central 6m.
- SRF volume is the fluid compartment with the highest agreement between different OCT manufacturers.
- Compartments that trigger treatment decision with anti-VEGF are IRF and SRF and they showed no significant differences between any of the devices in the clinically significant central 1mm.

Physiological changes in retinal layers thicknesses measured with swept source optical coherence tomography

AUTHORS: Vilades E, Perez-del Palomar A, Cegonino J, Obis J, Satue M, Orduna E, Pablo LE, Cipres M, Garcia-Martin E.

PUBLICATION: PLoS One. 2020 Oct 14;15(10):e0240441. DOI: 10.1371/journal.pone.0240441

STUDY PURPOSE

To evaluate the physiological changes related with age of all retinal layers thickness measurements in macular and peripapillary areas in healthy eyes.

OVERVIEW

STUDY DESIGN

Cross-sectional study

STUDY DEVICE(S)

- DRI Triton SS-OCT (Topcon, Tokyo, Japan)

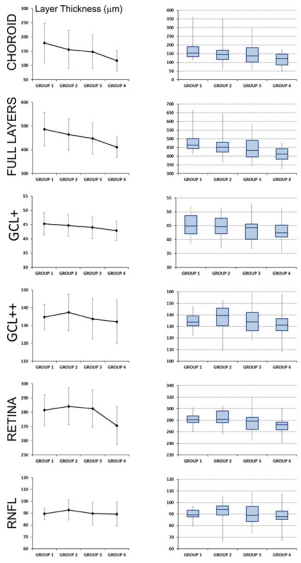
OF EYES/PATIENTS

- Total of 467 eyes from 467 healthy subjects.
- Subjects were categorized into four age groups: 20–34 years (group 1), 35–49 years (group 2), 50–64 years (group 3), and 65–79 years (group 4).

OUTCOME MEASURES

- The mean and standard deviation of the thickness evolution of each segmented layer were measured.
- Comparison between age groups was performed in four quadrants (temporal superior, temporal inferior, nasal superior, and nasal inferior) and four halves (superior, inferior, nasal, and temporal).

RESULTS



The most significant thinning of all retinal layers occurs particularly in the transition from group 2 to group 3, especially in the temporal superior quadrant at RNFL, GCL++ and retinal layers ($p<0.001$), and temporal superior, temporal inferior, and temporal half in choroid layer ($p<0.001$).

CONCLUSIONS

- Findings suggest that there is a progressive and physiological thinning of all retinal layers from the third decade of life.
- This study may be a base to build a normative database that allows health personnel to improve the interpretation of retinal measurements, even with a color scale similar to that of one used by most OCT devices. This is an important limitation of the current Triton software because we can visualize numerous measurements of all retinal layers, but ophthalmologists do not know if these values are normal for the age of each subject or patient.

FIGURE 3. Representation of mean and standard deviation for each layer measured by Triton optical coherence tomography, for the four age groups. On the left column, the mean and standard deviation are shown for each layer and age group. On the right column, the quartiles are plotted to show data dispersion and the presence of outliers.
Adapted from PLoS One. 2020 Oct 14;15(10):e0240441. DOI: 10.1371/journal.pone.0240441

Ciliary muscle dimensions by swept-source optical coherence tomography and correlation study in a large population

AUTHORS: Fernández-Vigo JI, Shi H, Kudsieh B, Arriola-Villalobos P, De-Pablo Gómez-de-Liaño L, García-Feijóo J, Fernández-Vigo JÁ.

PUBLICATION: Acta Ophthalmol. 2020 Jun;98(4):e487-e494. DOI: 10.1111/aos.14304

STUDY PURPOSE

To examine ciliary muscle (CM) dimensions in vivo by swept-source optical coherence tomography (SS-OCT) in a large healthy population.

OVERVIEW

STUDY DESIGN

Cross-sectional study

STUDY DEVICE(S)

- DRI OCT Triton™ (Topcon, Tokyo, Japan)

OF EYES/PATIENTS

- 495 eyes from 495 subjects

OUTCOME MEASURES

- CM length (CML), CM area (CMA) and CM thickness 1000 µm (CMT1), 2000 µm (CMT2) and 3000 µm (CMT3) from the scleral spur in the temporal and nasal quadrants.
- Anterior chamber angle (ACA) and iris thickness 500 µm (IT500) from the scleral spur were also measured.

RESULTS

- Mean CML was 4.57 ± 0.73 mm (range 2.16–6.97) and 4.45 ± 0.63 mm (2.42–6.37) in the temporal and nasal quadrants, respectively, with no differences detected between quadrants (p = 0.223).
- Reproducibility of the CM measurements was excellent (ICC > 0.878)
- Negative correlations were observed between refractive error and CML (R = -0.519; p < 0.001), and between refractive error and CM thickness (R ≥ -0.386; p < 0.001) or CMA (R = -0.538).
- Negative correlations were found between CM dimensions (CML, CMT, and CMA) and age, with the strongest correlation observed for CML (R = -0.516; p < 0.001).
- Ciliary muscle dimensions showed correlations with ACA (CML R = 0.499; CMT R = 0.434; CMA R = 0.545; all p < 0.001) and slightly with IOP (R = -0.175; p < 0.001) but no correlation was observed with IT500 (p ≥ 0.088).

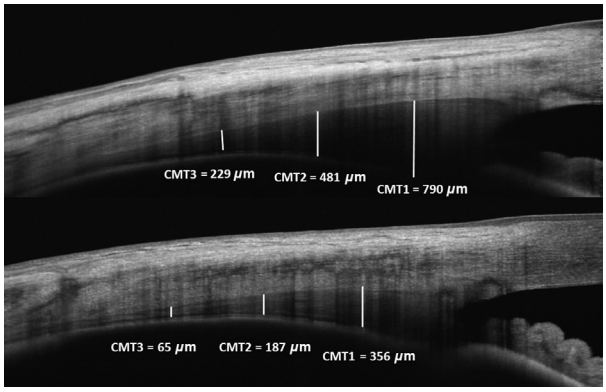


FIGURE. Swept-source optical coherence tomography ciliary muscle (CM) measurements made on a thick CM (upper image) and a thin CM (lower image). Adapted from Acta Ophthalmol. 2020 Jun;98(4):e487-e494. DOI: 10.1111/aos.14304

CONCLUSIONS

- This is the first study to use SS-OCT to assess CM dimensions in a large Caucasian population.
- A SS-OCT instrument was used to measure CM dimensions with excellent reproducibility.
- Data indicated a larger CB in myopia, a decrease produced with age, no correlation with gender, and good correlation with angle.
- Limitations included, only assessing the horizontal quadrant, occasional difficulty determining the ciliary pigmented epithelium boundary, and the posterior zonules are not visible in the OCT images.

Comparison of the Lamina Cribosa Measurements Obtained by Spectral-Domain and Swept-Source Optical Coherence Tomography

AUTHORS: Cakmak S, Altan C, Topcu H, Arici M, Pasaoglu I, Basarir B, Solmaz B.

PUBLICATION: Current Eye Research 44:9, 968-974, 2019. DOI: 10.1080/02713683.2019.1604971

STUDY PURPOSE

To compare the lamina cribrosa (LC) measurements obtained by Spectral-Domain Optical Coherence Tomography (SD-OCT) and Swept-Source Optical Coherence Tomography (SS-OCT) in the same eye and we also investigate how the differences in measurement will change in the presence of pseudoexfoliation glaucoma (PEG).

OVERVIEW

STUDY DESIGN

Cross-sectional comparative study

STUDY DEVICE(S)

- DRI OCT Triton™ (Topcon, Tokyo, Japan)
- SD-OCT Spectralis™ (Heidelberg Engineering)

OF EYES/PATIENTS

- 53 eyes for 30 patients included. Group 1 included 29 eyes from 15 healthy patients. Group 2 included 24 eyes from 15 patients with bilateral pseudoexfoliation glaucoma (PEG).

OUTCOME MEASURES

- Peripapillary RNFL thickness.
- Difference in Bruch's membrane opening (BMO) distance between devices.
- Lamina cribrosa (LC) depth and thickness, cup to disk (C/D) ratio.

RESULTS

- The difference between the mean BMO measured by SD-OCT (1504.7 ± 154.2 µm) and by SS-OCT (1568.6 ± 193.3 µm) was statistically significant (p = .009).
- The difference between LC depth and LC thickness measurements between two OCT devices were not statistically significant (Table).
- The differences of the parameters measured by two devices were compared between two groups, there was no significant difference between groups in terms of difference of LC depth and difference of LC thickness; a significant difference was found in difference of BMO (106.6 ± 175.2 µm in healthy group vs 12.4 ± 153.8 µm in PEG group; p = .045).
- There was a negative correlation between the difference of SS-OCT and SD-OCT BMO measurements and the cup/disc ratio (p = .007). Another negative correlation was observed between the difference of measurements of LC depth with two OCT devices and IOP (p = .015).
- There was a positive correlation with C/D ratio and BMO via SS-OCT , LC depth via both SS- and SD-OCT; negative correlation with C/D ratio and LC thickness via SS-OCT (p < .05, for each). There was a positive correlation between the difference of SS-OCT and SD-OCT BMO measurements and the RNFL thickness (p = .04).

	SD-OCT	SS-OCT	p Value*
BMO	1504.7 ± 154.2 µm	1568.6 ± 193.3 µm	0.009
LC Depth	412.6 ± 105.5 µm	419.4 ± 101.3 µm	0.40
LC Thickness	175.0 ± 48.8 µm	166.1 ± 42.8 µm	0.19

*: Paired sample t-test.

TABLE. Comparison of the mean ONH parameters measured by two devices in all groups. Adapted from Current Eye Research 44:9, 968-974, 2019. DOI: 10.1080/02713683.2019.1604971

CONCLUSIONS

- SS-OCT helps provide a clearer image of LC and promises to enable correct measurement of LC itself.
- As the C/D ratio increases, the difference between the BMO length measured by two devices decreases. This indicates that as the C/D ratio increases, the measurement qualities become more similar and supports the theory that sensitive measurements such as SS-OCT can be obtained with SD-OCT in glaucomatous damaged eyes. Also, this is supported by the positive correlation between BMO measurements via SD-OCT and C/D ratio.
- Screening for glaucoma in especially risky eyes and also glaucoma progression follow-up with ONH parameters should be done using the same OCT device.

Agreement Between Three Optical Coherence Tomography Devices to Assess the Insertion Distance and Thickness of Horizontal Rectus Muscles

AUTHORS: De-Pablo-Gómez-de-Liaño L, Fernández-Vigo JI, Ventura-Abreu N, García-Feijóo J, Fernández-Vigo JÁ, Gómez-de-Liaño R.

PUBLICATION: J Pediatr Ophthalmol Strabismus. 54(3):168–176, 2017. DOI: 10.3928/01913913-20161102-04

STUDY PURPOSE

To assess the agreement between two different spectral domain (SD-OCT) and one swept source (SS-OCT) optical coherence tomography device to measure the insertion distance and the thickness of the horizontal rectus muscles.

OVERVIEW

STUDY DESIGN

Prospective cross-sectional observational study.

STUDY DEVICE(S)

- DRI OCT Triton™ SS-OCT (Topcon, Tokyo, Japan)
- Spectralis® SD-OCT (Heidelberg Engineering Inc., Heidelberg, Germany)
- Cirrus® 5000 SD-OCT (Carl Zeiss Meditec, Dublin, CA)

OF EYES/PATIENTS

- 70 from 35 healthy hospital staff members, mean age 31.7+ 8.7 years (range: 22 to 61 years) 63% female, all Caucasian.

OUTCOME MEASURES

- Mean and standard deviation muscle thickness.
- Muscle thickness at 8.5 and 10.5mm from the limbus for the lateral rectus muscle and 7.2 and 9.2mm from the limbus for the medial rectus muscle.

RESULTS

There were no significant differences observed in the mean distances for the lateral and medial rectus muscles among the three devices. Additionally, there were no differences in the mean thickness of the lateral and medial rectus muscles among the three devices, with the best agreement observed between the Triton and Spectralis devices (Tables 1 and 2).

TABLE 1
Insertion Distance and Muscle Thickness Measurements With the Three Optical Coherence Tomography Devices[a]

Variable	Spectralis	Cirrus	Triton
Insertion distance (mm)			
Lateral rectus	6.51 ± 0.47 (5.36 to 7.30)	6.46 ± 0.47 (5.04 to 7.39)	6.50 ± 0.43 (5.46 to 7.34)
Medial rectus	5.20 ± 0.44 (4.13 to 5.98)	5.13 ± 0.44 (4.11 to 5.97)	5.11 ± 0.37 (4.39 to 5.93)
Muscle thickness (mm)			
Lateral rectus			
8.5	202.6 ± 39.4 (112 to 306)	199 ± 42.6 (110 to 290)	203.3 ± 50.6 (101 to 350)
10.5	195.6 ± 41.5 (135 to 330)	187.1 ± 44.6 (120 to 330)	198.1 ± 49.4 (126 to 339)
Medial rectus			
7.2	167.7 ± 33.5 (105 to 273)	170.7 ± 44.9 (90 to 290)	163.9 ± 30.1 (110 to 248)
9.2	205.2 ± 52.7 (106 to 386)	222.1 ± 57.8 (90 to 380)	225.6 ± 47.3 (123 to 329)

[a]All measurements recorded as mean ± standard deviation (range).
The Spectralis is manufactured by Heidelberg Engineering Inc., Heidelberg, Germany, the Cirrus is manufactured by Carl Zeiss Meditec, Dublin, CA, and the Triton is manufactured by Topcon, Inc., Tokyo, Japan.

TABLE 2
Agreement Between Insertion Distance and Muscle Thickness Measurements With the Three Optical Coherence Tomography Devices[a]

Variable	Spectralis–Cirrus	Spectralis–Triton	Cirrus–Triton
Insertion distance (mm)			
Lateral rectus (n = 70 of 70)	0.805 (0.687 to 0.879)	0.887 (0.819 to 0.930)	0.863 (0.778 to 0.916)
Medial rectus (n = 70 of 70)	0.699 (0.517 to 0.812)	0.715 (0.543 to 0.823)	0.629 (0.401 to 0.770)
Muscle thickness (mm)			
Lateral rectus			
8.5 (n = 66 of 70)	0.699 (0.516 to 0.813)	0.751 (0.598 to 0.845)	0.515 (0.218 to 0.699)
10.5 (n = 52 of 70)	0.819 (0.700 to 0.891)	0.854 (0.766 to 0.910)	0.800 (0.660 to 0.882)
Medial rectus			
7.2 (n = 66 of 70)	0.598 (0.352 to 0.751)	0.641 (0.423 to 0.777)	0.495 (0.459 to 0.789)
9.2 (n = 58 of70)	0.780 (0.624 to 0.869)	0.792 (0.582 to 0.887)	0.696 (0.507 to 0.813)

[a]All measurements recorded as intraclass correlation coefficient with a 95% confidence interval ICC (95% CI).
The Spectralis is manufactured by Heidelberg Engineering Inc., Heidelberg, Germany, the Cirrus is manufactured by Carl Zeiss Meditec, Dublin, CA, and the Triton is manufactured by Topcon, Inc., Tokyo, Japan.

TABLE 1 and 2. Adapted from J Pediatr Ophthalmol Strabismus. 54(3):168–176, 2017. DOI: 10.3928/01913913-20161102-04

CONCLUSIONS

- This study represents a direct comparison between two SD-OCT devices and one SS-OCT device; the results suggest that OCT is an effective, reproducible technique to measure insertion distance and thickness of the horizontal rectus muscles using a device readily available in daily practice.
- The authors supposed that even if the agreement is high between the devices in the insertion distance and moderate to good for the muscle thickness, it may not be high enough to consider an interchangeability of the measurements.

Agreement, repeatability, and reproducibility of quantitative retinal layer assessment using swept-source and spectral-domain optical coherence tomography in eyes with retinal diseases

AUTHORS: Hou H, Durbin MK, El-Nimri N, Fischer JL and Sadda SR.

PUBLICATION: Front Med (Lausanne). 2023 Dec 18; 10:10:1281751. DOI: 10.3389/fmed.2023.1281751

*HH, MD and NE-N are employees of Topcon Healthcare, Inc. SS received research support from Topcon Healthcare.

STUDY PURPOSE

To assess the agreement, repeatability, and reproducibility of retinal thickness measurements between swept-source OCT (SS-OCT) and spectral-domain OCT (SD-OCT) in healthy eyes and those with retinal diseases.

OVERVIEW

STUDY DESIGN

Cross-sectional, prospective

STUDY DEVICE(S)

- DRI OCT Triton™ (Topcon, Tokyo, Japan)
- 3D OCT-1 Maestro (Topcon, Tokyo, Japan)

OF EYES/PATIENTS

- 25 eyes from 25 healthy subjects
- 26 eyes from 26 patients with retinal diseases.

OUTCOME MEASURES

- Retinal Thickness Measurements: full retina, GCL+, and GCL++
- Agreement: how closely the measurements from the two different OCT devices (SS-OCT and SD-OCT) aligned with each other
- Repeatability: the consistency of measurements when repeated on the same eye under the same conditions using the same device
- Reproducibility: the consistency of results across different operators and devices, ensuring that the measurements are reliable even when taken under varied conditions

RESULTS

- High Agreement: The study found excellent agreement between the SS-OCT (Triton) and SD-OCT (Maestro) devices for retinal thickness measurements, with mean differences between the devices being small (less than 6 µm) and not statistically significant.
- Strong Repeatability: Both devices demonstrated high repeatability in retinal thickness measurements, with the repeatability limit of ≤7.6 µm for Triton and ≤12.7 µm for Maestro, and the repeatability coefficient of variation (CV%) being less than 2.6% for the Triton and less than 3.4% for the Maestro in eyes with retinal diseases.
- Good Reproducibility: The reproducibility of the measurements was also strong across both devices, reproducibility limit was ≤9.2 µm for Triton and ≤14.4 µm for Maestro, and reproducibility CV% less than 3.3% for the Triton and less than 3.5% for the Maestro in pathologic eyes.

CONCLUSIONS

- The Triton SS-OCT and Maestro SD-OCT devices are highly reliable for measuring retinal thickness, showing excellent repeatability and reproducibility in both healthy eyes and those with retinal diseases.
- The close alignment between the measurements from these two devices confirms their effectiveness in clinical practice, ensuring consistent and accurate retinal assessments.
- These OCT technologies may be used interchangeably in clinical settings, providing robust diagnostic and monitoring capabilities across different devices and operators, thereby enhancing their clinical utility.

ANALYSIS AND IMAGE QUALITY

Peer-Reviewed Publications Continued

Ocular axial length influence on peripapillary retinal nerve fiber layer thickness measurement with optical coherence tomography
Funes-Pérez E, Fernández-Hernández R, Rustullet-Olivé M, Mendieta-Rasos N, Saint-Gerons M, Matheu-Fabra A.
Archivos de la Sociedad Española de Oftalmología (English Edition),98: 8, 2023, 448-453, PMID: 37369323 DOI: 10.1016/j.oftale.2023.06.017

Optic Nerve Head Parameters in Saudi Male Young Adults Using Swept-source Optical Coherence Tomography
Challa NK.
Journal of Current Glaucoma Practice, Volume 17 Issue 2 (April–June 2023)
DOI: 10.5005/jp-journals-10078-1405

An AI model to estimate visual acuity based solely on cross-sectional OCT imaging of various diseases
Inoda S, Takahashi H, Arai Y, Tampo H, Matsui Y, Kawashima H, Yanagi Y.
Graefes Arch Clin Exp Ophthalmol 261, 2775–2785, 2023. PMID: 37166519
DOI: 10.1007/s00417-023-06054-9

Comparison of Macular Thickness Measurements Using Swept-Source and Spectral-Domain Optical Coherence Tomography in Healthy and Diabetic Subjects
Xiong K, Gong X, Li W, Yuting L, Meng J, Wang L, Wang W, Wenyong H.
Current Eye Research, 46(10), 1567–1573, 2021. PMID: 33879001
DOI: 10.1080/02713683.2021.1908566

Lamina cribrosa surface position in idiopathic intracranial hypertension with swept-source optical coherence tomography
Pasaoglu I, Satana B, Altan C, Artunay O, Basarir B, Onmez FE, Inal A.
Indian Journal of Ophthalmology 67(7), 1085-1088, 2019. PMID: 31238417
DOI: 10.4103/ijo.IJO_1736_18

Influence of Retinal Pathology on the Reliability of Macular Thickness Measurement: A Comparison Between Optical Coherence Tomography Devices
Bahrami B, Ewe SYP, Hong T, Zhu M, Ong G, Luo K, Chang A.
Ophthalmic Surgery, Lasers and Imaging Retina, 48(4):319–325, 2017. PMID: 28419397
DOI: 10.3928/23258160-20170329-06

Is the Optic Nerve Head Structure Impacted by a Diagnostic Lumbar Puncture in Humans?
Poli M, Denis P, Sellem E, Aho-Glélé LS, Bron AM.
Journal of Glaucoma 26(11):p 1036-1040, November 2017. PMID: 28777226
DOI: 10.1097/IJG.0000000000000752

GLAUCOMA

Peer-Reviewed Publications

Agreement and Precision of Wide and Cube Scan Measurements between Swept-source and Spectral-domain OCT in Normal and Glaucoma Eyes

AUTHORS: Hou H, El-Nimri NW, Durbin MK, Arias JD, Moghimi S, Weinreb RN.*

PUBLICATION: Sci Rep. 2023 Sep 23;13(1):15876

*HH, NWE, MKD, and JDA are employees of Topcon Healthcare. RNW is a consultant for Topcon Healthcare.

STUDY PURPOSE

To evaluate the agreement of wide scan measurements between Triton™ SS-OCT and Maestro™ SD-OCT and to assess the repeatability and reproducibility of measurements from the wide scan and the macula/optic disc cube scans of the two devices in normal and glaucoma eyes, and to further evaluate the interoperability of these two technologies.

OVERVIEW

STUDY DESIGN

Prospective

STUDY DEVICE(S)

- DRI OCT Triton™ (Topcon, Tokyo, Japan)
- 3D OCT-1 Maestro (Topcon, Tokyo, Japan)

OF EYES/PATIENTS

- 25 normal eyes & 25 glaucoma eyes

OUTCOME MEASURES

- cpRNFL(circumpapillary retinal nerve fiber layer), macular GCL + IPL (GCL+), macular GCL + IPL + RNFL (GCL++)

RESULTS

- GCL++ thickness measurements from both the wide scan and the macular cube scan on the Triton showed CV (coefficient of variation) within 1 % for repeatability and reproducibility for both normal and glaucoma groups.
- GCL+ thickness measurements from both the wide scan and the macular cube scan on the Triton showed CV within 1 % for repeatability and reproducibility for the normal group.
- RNFL thickness measurements from both the wide scan and the optic disc cube scan on the Triton showed CV within 3.4 % for both repeatability and reproducibility for the glaucoma group and a CV within 2.4% for the normal group.
- Wide scan measurements from both devices have shown excellent agreement with each other (intercepts did not significantly differ from 0 and the slopes did not differ significantly from 1)
- The differences between Triton and Maestro (mean difference of all measurements <3 µm) were less than the axial resolution in tissue (Triton axial resolution 8 µm, Maestro axial resolution 6 µm), and smaller than the corresponding reproducibility limits.

CONCLUSIONS

- Wide scan measurements from both devices have shown excellent agreement with each other in both normal and glaucoma eyes.
- Wide scans including the ONH and the macula may provide benefits for glaucoma diagnostics, as they reduce the workflow burden and provide widefield thickness maps uncovering defects potentially missed distant to the ONH.

Optic Nerve Head Changes After Intraocular Pressure-Lowering Glaucoma Surgeries Using Optical Coherence Tomography

AUTHORS: Silveira V d'Azevedo, Lindenmeyer RL, Pakter HM, Skaat A, Lavinsky D, Oliveira M, Picceti E, Lavinsky J, de Arruda Mello PA, Lavinsky F.

PUBLICATION: Journal of Glaucoma 32(9):p 756-761, September 2023. | DOI: 10.1097/IJG.0000000000002242

STUDY PURPOSE

To detect changes in the ONH with SS-OCT after IOP-lowering procedures.

OVERVIEW

STUDY DESIGN

Prospective, longitudinal study

STUDY DEVICE(S)

- DRI Triton Plus SS-OCT (Topcon, Tokyo, Japan)

OF EYES/PATIENTS

- 15 eyes of 12 glaucoma patients indicated for surgical intervention.

OUTCOME MEASURES

- Mean and standard deviation of the hypotenuse of the optic nerve head cup (HOC).
- HOC parameters of length and depth.
- Change in the BMO-to-BMO (Bruch Membrane Opening) diameter.
- Time points: baseline, PO1 (up to 7 days postoperatively), and PO2 (between 30-90 days postoperatively).

RESULTS

- The measurements were obtained manually by a single trained examiner (V.A.S.) using the caliper function of the device's commercially available software (IMAGEnet 6).
- Mean HOC decreased significantly after the IOP-lowering procedures, markedly between the preoperative period and PO1: 1002.21 µm–921.13 µm, (95% CI:-135.104 to-27.067, P= 0.001).
- There was no significant change in any parameter between PO1 and PO2 (P= 1.0).
- The mean HOC depth and length in the 5 central B-scans, and the horizontal BMO to-BMO extension also decreased significantly.

CONCLUSIONS

- The study suggests that small postoperative changes in the ONH of patients with glaucoma can be measured by very precise methods, such as OCT, even if they are not visible by direct fundoscopic evaluation of the optic nerve.
- Significant structural changes in the ONH, mainly between the preoperative and early post-operative periods, were observed and measured. This suggests that decompression has a mechanical effect during the immediate post operative period.
- The authors noted that the study has some limitations. First, the patient sample was small; recruitment was limited due to coronavirus disease pandemic protocols. Second, most of the participants had advanced glaucoma and third, the examiner was not masked for the sequence of visits. However, the measurements were performed objectively by an expert-trained examiner simulating the clinical setting. Finally, the follow up was short (3m), longer longitudinal studies are necessary.

Three-Dimensional Evaluation of Posterior Pole and Optic Nerve Head in Myopes with Glaucoma

AUTHORS: Kim YC, Jung KI, Lopilly Park HY, Park CK.

PUBLICATION: Sci Rep 7, 18001 (2017). DOI: 10.1038/s41598-017-18297-8

STUDY PURPOSE

To compare the deepest point in the eye (DPE) in myopes with and without normal tension glaucoma (NTG).

OVERVIEW

STUDY DESIGN

Retrospective

STUDY DEVICE(S)

- DRI Triton SS-OCT (Topcon, Tokyo, Japan)

OF EYES/PATIENTS

- Myopic, Korean patients with NTG (129 eyes) and without NTG (125 eyes)

OUTCOME MEASURES

- Deepest point of the eyeball (DPE), configuration of posterior pole with DPE position, posterior pole classification with DPE location, optic disc torsion, optic disc tilt

RESULTS

- Posterior pole profiles and the optic disc configurations between the myopes without NTG and myopes with NTG were found to be significantly different.
- Disc-DPE distance was significantly greater in glaucomatous eyes than non-glaucomatous eyes(4.01 ± 1.27 vs. 3.66 ± 1.31 mm; P = 0.031).
- Disc-DPE depth was greater in those with glaucoma than those without (0.17 ± 0.16 vs. 1.3 ± 0.17 mm; P = 0.057).
- The disc configuration of ovality index, horizontal tilt angle, and vertical tilt angle was significantly larger in the myopes with NTG (P < 0.001, P < 0.001, and P = 0.035, respectively). However, the Disc-DPE angle, disc fovea angle, and disc torsion angle were not significantly different between the glaucomatous myopes and the healthy myopes (P=0.896, P=0.448, and P = 0.196, respectively).

CONCLUSIONS

- Between myopes with and without NTG with similar axial length, myopes with NTG had deeper and more distant location of the DPE from the optic disc.
- The data suggests that the parameter DPE may provide a proper standard to analyze the posterior pole of myopes than the parameter axial length.

GLAUCOMA

Peer-Reviewed Publications Continued

Computational study on the effects of central retinal blood vessels with asymmetric geometries in optic nerve head biomechanics
Otani R, Miyata K, Miki A, Wada S.
Med Eng Phys 123:104086; 2024 Jan:. DOI: 10.1016/j.medengphy.2023.104086

Wide-field optical coherence tomography deviation map for early glaucoma detection
Kim H, Park HM, Jeong HC, Moon SY, Cho H, Lim HW, Seong M, Park J, Lee WJ.
British Journal of Ophthalmology 2023;107:49-55. DOI: 10.1136/bjophthalmol-2021-319509

Lamina Cribrosa Morphology in Normal Tension Glaucoma According to the Location of Visual Field Defects
Kang YS, Haowei Z, Sung MS, Park SW.
Journal of Glaucoma 32(6):p 466-473, June 2023. PMID: 36897662
DOI: 10.1097/IJG.0000000000002202

Comparison of Diagnostic Ability Between Wide-Field Swept-Source Optical Coherence Tomography Imaging Maps and Heidelberg Retina Tomograph 3 Optic Nerve Head Assessment to Discriminate Glaucomatous and Non-glaucomatous Eyes
Kourkoutas D, Triantafyllopoulos G, Georgiou I, Karamaounas A, Karamaounas N, Sotiropulos K, Kapralos D. Cureus 14(8), 2022 : e28188. PMID: 36158420 DOI: 10.7759/cureus.28188

The thickness of the outer retina in the macula and circumpapillary area in patients with unilateral advanced glaucoma
Vahedian Z, Fakhraie G, Ghasemi M, Azimi A, Tabatabaei SM.
Graefes Arch Clin Exp Ophthalmol 260, 3935–3944 (2022). PMID: 35838807
DOI: 10.1007/s00417-022-05756-w

Association between Topographic Features of the Retinal Nerve Fiber Bundle and Good Visual Acuity in Patients with Glaucoma
Takahashi N, Omodaka K, Kikawa T, Akiba M, Nakazawa T.
Current Eye Research, 46(11), 1724–1731, 2021. PMID: 33858282 DOI: 10.1080/02713683.2021.1912782

Macular pigment optical density change analysis in primary open-angle glaucoma and pseudoexfoliation glaucoma
Zeki Fikret C, Ucgun NI.
Int Ophthalmol 41, 2235–2240 (2021). PMID: 33759069 DOI: 10.1007/s10792-021-01784-3

Ciliary muscle dimensions measured by swept-source optical coherence tomography in eyes with primary open-angle glaucoma and healthy eyes
Kudsieh B, Fernández-Vigo JI, Shi H, De Pablo Gómez de Liaño L, Ruiz-Moreno JM, García-Feijóo J, Fernández-Vigo JÁ.
Int Ophthalmol 40, 2247–2255 (2020). PMID: 32388672 DOI: 10.1007/s10792-020-01405-5

Comparison of Diagnostic Power of Optic Nerve Head and Posterior Sclera Configuration Parameters on Myopic Normal Tension Glaucoma
Kim, YC, Cho, BJ, Jung, KI, Park, CK.
Journal of Glaucoma 28(9):p 834-842, September 2019. DOI: 10.1097/IJG.0000000000001328

Evaluation of Papillomacular Nerve Fiber Bundle Thickness in Glaucoma Patients with Visual Acuity Disturbance.
Takahashi N, Omodaka K, Pak K, Kikawa T, Kobayashi W, Akiba M, Nakazawa T.
Current Eye Research, 45(7), 847–853, 2019. PMID: 31880172 DOI: 10.1080/02713683.2019.1703006

The Location of the Deepest Point of the Eyeball Determines the Optic Disc Configuration
Kim, YC, Jung, Y, Park, HYL, Park, CK.
Sci Rep 7, 5881 (2017). DOI: 10.1038/s41598-017-06072-8

Qualitative analysis of repaired filtering blebs with anterior segment-optical coherence tomography.
Cerdà-Ibáñez M, Pérez-Torregrosa VT, Olate-Pérez A, Almor Palacios I, Gargallo-Benedicto A, Osorio-Alayo V, Barreiro Rego A, Duch-Samper A.
Archivos de la Sociedad Española de Oftalmología 92(8): p 359-365, 2017. PMID: 28188019
DOI: 10.1016/j.oftal.2016.11.015

Retinal Nerve Fiber Layer Optical Texture Analysis: Detecting Axonal Fiber Bundle Defects in Patients with Ocular Hypertension
Clarice Kai-Ying Su, Philip Yawen Guo, Poemen Pui Man Chan, Alexander Ka-Ngai Lam, Christopher Kai Shun Leung.
Ophthalmology. 2023 Oct;130(10):1080-1089. PMID: 37315588

Diagnostic assessment of glaucoma and non-glaucomatous optic neuropathies via optical texture analysis of the retinal nerve fibre layer
Leung CKS, Lam AKN, Weinreb RN, Garway-Heath DF, Yu M, Guo PY, Chiu VSM, Wan KHN, Wong M, Wu KZ, Cheung CYL, Lin C, Chan CKM, Chan NCY, Kam KW, Lai GWK.
Nature Biomedical Engineering 6, 593-604 (2022); DOI: 10.1038/s41551-021-00813-x

Retinal Nerve Fibre Layer Optical Texture Analysis Detecting Axonal Fibre Bundle Defects in Patients with Ocular Hypertension
Su CKY, Guo PY, Chan PPM, Lam AKN, Leung CKS.
Ophthalmology, Volume 130, Issue 10, P1080-1089, October 2023, DOI: 10.1016/j.ophtha.2023.06.004

Retinal Nerve Fiber Layer Optical Texture Analysis and 10-2 Visual Field Assessment in Glaucoma

Kamalipour A, Moghimi S, Khosravi P, Tansuebchueasai N, Vasile C, Adelpour M, Gunasegaran G, Nishida T, Zangwill LM, Lam AKN, Leung CKS, Weinreb RN.
American Journal of Ophthalmology, Volume 266, P118-134, October 2024,
DOI: 10.1016/j.ajo.2024.05.013

Wide-field Trend-based Progression Analysis of Combined Retinal Nerve Fibre Layer and Ganglion Cell Inner Plexiform Layer Thickness; A new Paradigm to Improve Glaucoma Progression Detection

Wu K, Lin C, Lam AKN, Chan L, Leung CKS.
Ophthalmology, Volume 127, 10, p 1322-1330, October 2020, DOI: 10.1016/j.ophtha.2020.03.019

REFRACTIVE ERROR

Peer-Reviewed Publications

Choroidal Thickness Profiles and Associated Factors in Myopic Children

AUTHORS: Kobia-Acquah E, Flitcroft DI, Lingham G, Paudel N, Loughman J.

PUBLICATION: Optometry and Vision Science 100(1):p 57-66, January 2023. DOI: 10.1097/OPX.0000000000001973

* JL received financial support from Topcon Europe Medical B.V.

STUDY PURPOSE

The study was designed to describe the macular choroidal thickness profiles and investigate possible determinants of choroidal thickness among children with different degrees of myopia.

OVERVIEW

STUDY DESIGN

Investigator-led, double-masked, placebo-controlled, randomized clinical trial

STUDY DEVICE(S)

- DRI OCT Triton Plus (Topcon, Tokyo, Japan)
- Aladdin HW3.0 (Visia Imaging S.r.l., San Fiobanni, Valdarno, Italy)
- Grand Seiko Opn Field autorefractor (WAM-5500 Auto Ref/Keratometer; Grand Seiko, Kawaga, Japan)

OF EYES/PATIENTS

- 250 myopic children aged 6 to 16 years

OUTCOME MEASURES

- Axial length, anterior chamber depth, central corneal thickness, lens thickness.
- Corrected VA, cycloplegic refraction
- Choroidal thickness

RESULTS

- Overall mean ± SD subfoveal choroidal thickness was 234.9 ± 63.7 µm (range, 78.6 to 391.1 µm). Subfoveal choroidal thickness was negatively correlated with axial length, each additional millimeter in axial length equated to a 21-µm thinner choroidal thickness (R = −0.35, P < .001), and positively correlated with spherical equivalent refraction, with each additional diopter of myopia equating to a 10µm thinner choroidal thickness (R = 0.30, P < . 001)
- Overall, repeated-measures analysis of variance showed that choroidal thickness varied significantly across the macular locations ($F_{8,1928}$ = 431.6, P < .001): thickest in the perifoveal superior region (mean ± SD, 249.0 ± 60.8 µm) and thinnest in the perifoveal nasal region (155.1 ± 50.3 µm). This was consistent for low and moderate myopia, but the parafoveal temporal region was thickest in high myopia (211.1 ± 60.3 µm)
- Participants with longer axial length (≥26 mm) exhibited significantly thinner choroidal thickness compared with shorter (≤24 mm) and medium (>24 to <26mm) axial length at all locations (P < .001 for all). The high myopia group had significantly thinner choroidal thickness compared with the low myopia group at all locations with the biggest and smallest mean differences between high and low myopia observed in the subfoveal (−57.3 µm) and perifoveal nasal (−32.8 µm) regions, respectively (P < .001).

CONCLUSIONS

- Axial length and spherical equivalent refraction were the key determinants of choroidal thickness, each accounting for approximately 10% of the variance in subfoveal choroidal thickness.
- Assessment of choroidal thickness may provide additional information to assist in identifying myopic children most at risk of myopic progression or future chorioretinal disease.

REFRACTIVE ERROR

Peer-Reviewed Publications Continued

Retinal and Choroidal Changes in Children with Moderate-to-High Hyperopia

Qian Y, Ma Y, Lin Q, Xiang Z, Qiang J, Xu Y, Zou H.
J Ophthalmol. 2021 Sep 30;2021:9971564. DOI: 10.1155/2021/9971564

CORNEA

Peer-Reviewed Publications

Evaluation of scleral thickness in patients with Fuchs endothelial dystrophy

AUTHORS: Korkmaz I, Degirmenci C, Selver OB, Palamar M.

PUBLICATION: Graefes Arch Clin Exp Ophthalmol 261, 2883–2889 (2023). PMID: 37178183 DOI: 10.1007/s00417-023-06107-z

STUDY PURPOSE

The aim of this study is to evaluate scleral thickness using AS-OCT (anterior-segment OCT) in patients with FED (Fuchs endothelial dystrophy) and compare the results with healthy individuals and to make an assumption of the affection of the sclera.

OVERVIEW

STUDY DESIGN

Prospective cross-sectional study

STUDY DEVICE(S)

- Anterior segment module of the SS-OCT Triton (AS-OCT, DRI Triton, Topcon, Japan)
- Specular Microscopy (Nidek Co, Ltd, Gamagori, Japan)

OF EYES/PATIENTS

- 32 eyes of 32 patients with FED and 30 eyes of 30 age, gender, spherical equivalent and axial length matched healthy participants

OUTCOME MEASURES

- Scleral thickness in superior, inferior, nasal, and temporal quadrants 6mm, 4mm and 2mm posterior to the scleral spur – measured with AS-OCT
- Endothelial cell density (ECD) and central corneal thickness (CCT) – measured with specular microscopy

RESULTS

- Mean CCT was significantly greater in the FED group (mean 586.8 ± 33.1; range 514–635 µm) than in the control (mean 545.0 ± 20.7; range 503–587 µm) (p = 0.000).
- Mean scleral thickness 6 mm posterior to the scleral spur in the FED group was significantly higher in all quadrants than in the control group (p = 0.000) (Table 1).
- Mean ECD was lower and mean CCT was higher in the FED group than in healthy individuals. (Table 1).
- Mean scleral thicknesses at 2mm and 4mm posterior to the scleral spur in the FED group were significantly higher in all quadrants than in the control group (p=0.000).

Table 1 Demographic data and the variables of the groups

Variables	FED Group (n = 32)	Control Group (n = 30)	*p* value
Age (years) Mean ± SD Range	62.5 ± 13.2 33–81	64 ± 8.1 48–81	> 0.05
F/M	28/4	24/6	> 0.05
CCT (µm) Mean ± SD Range	586.8 ± 33.1 514–635	545.0 ± 20.7 503–587	**< 0.05***
ECD (cells/mm²) Mean ± SD Range	1935.3 ± 462.6 1436–2560	2518.3 ± 298.6 2153–3095	**< 0.05***
Superior Scleral Thickness (µm) Mean ± SD Range	434.0 ± 30.6 371–498	381.3 ± 20.0 341–436	**< 0.05***
Inferior Scleral Thickness (µm) Mean ± SD Range	442.8 ± 27.6 395–502	383.2 ± 16.0 352–436	**< 0.05***
Nasal Scleral Thickness (µm) Mean ± SD Range	447.7 ± 31.4 382–502	389.2 ± 21.0 353–440	**< 0.05***
Temporal Scleral Thickness (µm) Mean ± SD Range	443.4 ± 30.3 386–504	383.2 ± 19.2 349–440	**< 0.05***

*$p < 0.05$ considered as a significant

Abbreviations: FED, Fuchs endothelial dystrophy; F, Female; M, Male; SD, Standard Deviation; CCT, Central corneal thickness; ECD, Endothelial cell density

Bold means statistically significant

TABLE 1. Adapted from Graefe's Arch Clin Exp Ophthalmol (2023) 261:2883–2889 DOI: 10.1007/s00417-023-06107-z

CONCLUSIONS

- Scleral thickness, as measured by AS-OCT, was found to be significantly higher in patients with FED compared to the control group. These findings suggest that the accumulation of extracellular deposits in FED may not be limited to the cornea but may also affect the sclera.

The Role of Hi-Tech Devices in Assessment of Corneal Healing in Patients with Neurotrophic Keratopathy

AUTHORS: Inferrera L, Aragona E, Wylęgała A, Valastro A, Latino G, Postorino EI, Gargano R, Orzechowska-Wylęgała B, Wylęgała E, Roszkowska AM.

PUBLICATION: J. Clin. Med., 11(6), 2022. PMID: 35329927 DOI: 10.3390/jcm11061602

STUDY PURPOSE

The aim of this study is to analyze the morphological changes occurring during the healing of the corneal ulcers in patients with severe Neurotrophic Keratopathy (NK) treated with rh-NGF.

OVERVIEW

STUDY DESIGN	STUDY DEVICE(S)	# OF EYES/PATIENTS	OUTCOME MEASURES
Prospective, cross-sectional study	• Anterior segment module of the SS-OCT Triton (AS-OCT, DRI Triton, Topcon, Japan) • Keratograph 5M (OCULUS Optikgeräte GmbH, Wetzlar, Germany) • Laser Scanning Confocal microscope represented by Heidelberg retina tomograph (HRT) Rostock Cornea Module (Heidelberg Eng GmbH)	• 13 eyes in 13 patients with varying grades of NK	• Reduction of the area of the ulcer, and recovery of the corneal thickness at baseline, 4 and 8 wks post treatment.

RESULTS

- At the eighth week, all corneal defects healed.
- Median OCT levels for the three times were 333, 401, and 454 respectively for baseline, 4 weeks and 8 weeks.
- Post hoc analysis showed statistically significant differences in all three follow-up times considered, with an increase in OCT levels ($p = 0.015$ first time vs. 4 weeks; $p = 0.016$ first time vs. 8 weeks and $p = 0.016$ 4 weeks vs. 8 weeks). (Figure 2).
- The confocal examination was performed only in three cooperating patients at baseline and in five subjects at 8 weeks at the end of treatment. The total absence of nerves was observed at baseline examination, whereas after 8weeks in four eyes the presence of sporadic fibers was detected.

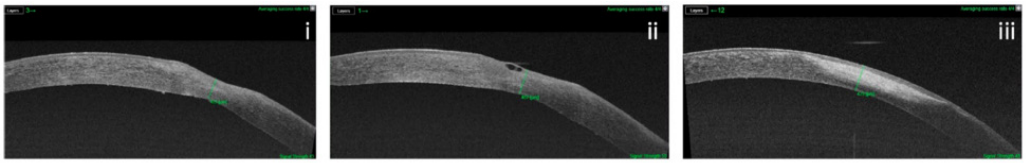


FIGURE 2. Variation of ulcer's depth in a patient with post-herpetic NK treated with rh-NGF. The corneal thickness was calculated with OCT software at baseline: (i) 4 weeks, (ii) and 8 weeks (iii).Adapted from J. Clin. Med., 11(6), 2022. PMID: 35329927 DOI: 10.3390/jcm11061602

CONCLUSIONS

- AS-OCT was used to analyze the corneal thickness changes in the response to treatment with Cenegermin in patients with severe NK. The results showed a significant increase of the corneal thickness that permitted us to consider the importance of imaging in monitoring the healing process.
- In the present study, we measured the extension and depth of the corneal defects, and we were able to provide a statistical assessment of the morphological changes occurring in the corneal tissue as a response to therapy.
- Devices provided detailed information on the healing processes, improving our knowledge on corneal changes induced by therapy.

CORNEA

Peer-Reviewed Publications Continued

Anterior Segment Swept Source Optical Coherence Tomography and In Vivo Confocal Microscopy Findings in a Case With Bleb-Like Epithelial Basal Membrane Dystrophy
Eker S, Oflaz AB, Bozkurt B.
Cornea 42(8):p 1049-1051, August 2023. PMID: 36728322
DOI: 10.1097/ICO.0000000000003241

Neurotrophic Keratopathy in Systemic Diseases: A Case Series on Patients Treated With rh-NGF
Meduri A, Oliverio GW, Valastro A, Azzaro C, Camellin U, Franchina F, Inferrera L, Roszkowska A, Aragona P.
Front Med (Lausanne). ;9:920688; 2022. PMID: 35707524 DOI: 10.3389/fmed.2022.920688

Clinical and instrumental assessment of the corneal healing in moderate and severe neurotrophic keratopathy treated with rh-NGF (Cenegermin)
Roszkowska AM, Inferrera L, Aragona E, Gargano R, Postorino EI, Aragona P.
European Journal of Ophthalmology. 32(6):3402-3410; 2022. PMID: 35473440
DOI: 10.1177/11206721221097584

Repeatability of OCT Anterior Surface and Bowman's Layer Curvature and Aberrations in Normal and Keratoconic Eyes
Matalia H, Chinnappaiah N, Chandapura R, Galiyugavaradhan S, Shetty R, Sinha Roy A.
Journal of Refractive Surgery, 36(4):247–252; 2020. PMID: 32267955
DOI: 10.3928/1081597X-20200121-02

DIABETIC RETINOPATHY

Peer-Reviewed Publications

Macular Choroidal Thickness and the Risk of Referable Diabetic Retinopathy in Type 2 Diabetes: A 2-Year Longitudinal Study

AUTHORS: Wang W, Li L, Wang J, Chen Y, Kun X, Gong X, Wei D, Wang D, Liang X, Liu H, Huang W.

PUBLICATION: Invest Ophthalmol Vis Sci. 2022; 63(4):9. PMID: 35420642 DOI: 10.1167/iovs.63.4.9

STUDY PURPOSE

To evaluate the associations between choroidal thickness (CT) and the 2-year incidence of referable diabetic retinopathy (RDR).

OVERVIEW

STUDY DESIGN

Prospective, longitudinal, cohort study

STUDY DEVICE(S)

- DRI Triton SS-OCT (Topcon, Tokyo, Japan)

OF EYES/PATIENTS

- 1345 patients with diabetes

OUTCOME MEASURES

- Primary outcome was new-onset RDR at 2 years; defined as patients with NDR, or mild NPDR, and without DME at baseline who developed RDR over the 2-year follow up
- Secondary outcome was new-onset DME during the 2-year follow-up

RESULTS

- At the 2-year follow-up, 120 (8.92%) of the included patients had newly developed RDR, and seven (0.52%) developed DME.
- CT was significantly thinner in patients with new-onset RDR than in non-RDR patients, with an average CT of 166.3+55.6 µm vs 199.3+62.5 µm (P<0.001) and a CT in the central field of 183.1+65.1 µm vs 218.2+72.3 µm (P<0.001).
- Significant association was seen between the CT in the central field and RDR risk (RR=0.922, 95% CI = 0.895-0.950, P<0.001).
- Participants who developed DME during the follow-up period had thinner average CT than those without DME, but the difference did not reach a significant level.
- Average CT was not significantly associated with the risk of DME (RR – 0.998, 95% CI = 0.886-1.124, P=0.972).

CONCLUSIONS

- The study provides the first longitudinal evidence of the predictive value of choroidal thickness for DR onset and progression.
- The study is limited in that the subjects were all Chinese patients with type 2 DM; CT measurements may differ by ethnicity and type of diabetes, so the conclusions should not be generalized to other races.
- Automated quantitative assessment of CT using SS-OCT can provide prognostic information about RDR risk in patients with type 2 DM.

Sub-clinical thickening of the fovea in diabetes and its relationship to glycaemic control: a study using swept-source optical coherence

AUTHORS: Aitchison RT, Kennedy GJ, Shu X, Mansfield DC, Shahani U.

PUBLICATION: Graefe's Archive for Clinical and Experimental Ophthalmology (2021) 259: 633-641.
DOI: 10.1007/s00417-020-04914-2

STUDY PURPOSE

This study aimed to use swept-source optical coherence tomography (SS-OCT) to measure foveal thickness and macular volume in diabetic individuals without cystoid macular oedema, and in non-diabetic individuals, and relate these measures to participants' glycaemic control.

OVERVIEW

STUDY DESIGN

Cross-sectional study

STUDY DEVICE(S)

- DRI Triton SS-OCT (Topcon, Tokyo, Japan)

OF EYES/PATIENTS

- Fifty-four Caucasian participants
- Diabetic n=27(type 1 n=7, type 2 n=20), non-diabetic n=27

OUTCOME MEASURES

- Center Point Thickness (CPT) which was the distance between the inner limiting membrane and the outer segment retinal pigment epithelium interface. Measured at the foveola: the locus of the intersection of the six radial scans comprising the 3D macula scan
- Total macular volume (TMV) in mm3 calculated using the mean thickness in microns of each of the 9 sub-fields of the EDTRS grid.
- HbA1c levels

RESULTS

- Diabetic individuals had a statistically significantly greater CPT compared with their non-diabetic counterparts (p=0.0005).
- HbA1c level significantly predicted the CPT in the diabetic group (p=0.0005), with a 19µm increase in CPT for every 1% increase in HbA1c level.
- Individuals with type 1 diabetes had greater CPT than those with type 2, the difference was not statistically significant.
- There was no significant difference between the diabetic and non-diabetic groups for TMV.
- HbA1c level did not predict TMV in either group.

CONCLUSIONS

- The authors stated that the use of SS-OCT is the only way to quantifiably measure foveolar thickness in vivo.
- Diabetic individuals had significantly greater foveolar thickness compared with their age- and sex-matched non-diabetic counterparts.
- The authors suggest that the more severe abnormality of DCMO might be preceded by a pre-clinical phase of non-cystoid thickening.

Optical Coherence Tomography Predictors of Favorable Functional Response in Naïve Diabetic Macular Edema Eyes Treated with Dexamethasone Implants as a First-Line Agent

AUTHORS: Meduri A, Oliverio GW, Trombetta L, Giordano M, Inferrera L, Trombetta CJ.

PUBLICATION: J Ophthal 2021; Article ID 6639418, 5 pages. DOI: 10.1155/2021/6639418

STUDY PURPOSE

To evaluate efficacy and safety of intravitreal dexamethasone 0.7mg implant in treatment-naïve DME patients and to assess the utility of OCT structural biomarkers as predictors of functional response after treatment.

OVERVIEW

STUDY DESIGN

Longitudinal, cross-sectional study

STUDY DEVICE(S)

- DRI Triton SS-OCT (Topcon, Tokyo, Japan)

OF EYES/PATIENTS

- Thirty-nine patients (19 males, 20 females) with DME. Twenty-one patients (53.8%) presented cystoid macular edema, 18 patients (46.2%) presented a subfoveal neuroretinal detachment.

OUTCOME MEASURES

- Possible OCT biomarkers CRT(central retinal thickness), IRC (intraretinal cysts), CT (choroidal thickness), SRD(serous retinal detachment), HRS (hyperreflective spots), EZ (ellipsoid zone), VMA (vitreomacular adhesions) as predictive factors for visual acuity improvement after 3, 6 and 12months following treatment

RESULTS

- Figure 1 shows the structural biomarkers evaluated over a 3mm area.
- At 3 months the mean BCVA improved from 51.6+ 17.1 to 58.9 + 16.5 ETDRS letters (p=0.01) and to 57.6+17.3 and to 56.9+ 17.5 at 6 and 12 months respectively (p=0.03).
- There were statistically significant changes in CRT, IRC dimension, HRS number and SRD height after treatment throughout follow-up. No significant changes in CT were observed.
- A >10-letter improvement in BCVA was present in 48.7% of the patients at the end of follow-up.
- The presence of EZ integrity and SRD at baseline were predictors of good functional treatment response at 12 months.
- Eyes without vitreoretinal interface alterations at baseline presented a better functional outcome at 12 months.

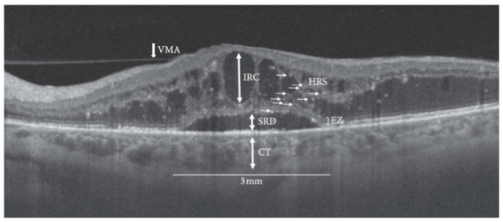


FIGURE 1. SS-OCT radial scan (9mm)... showing structural biomarkers evaluated within a 3mm area centered on the fovea.
Adapted from J Ophthal 2021; Article ID 6639418, 5 pages. DOI: 10.1155/2021/6639418.

CONCLUSIONS

- The study confirmed the efficacy and safety of intravitreal dexamethasone implant in the treatment of naïve DME patients and demonstrated a better functional response in patients with the presence of SRD and EZ integrity and absence of vitreomacular alterations; however, further studies are necessary to assess the usefulness of OCT structural biomarkers as predictors of functional response in DME patients.
- The authors stated that the improvement in BCVA of >10-letters in 48.7% was in accordance with previous findings[1]
- Findings emphasize the importance of accurate evaluation of structural biomarkers to choose the best treatment for the patient.

[1]A. Rosenblatt, P. Udaondo, J. Cunha-Vaz et al., "A collaborative retrospective study on the efficacy and safety of intravitreal dexamethasone implant (ozurdex) in patients with diabetic macular edema," Ophthalmology, vol. 127, no. 3, pp. 377-393, 2020.

DIABETIC RETINOPATHY

Peer-Reviewed Publications Continued

Automated Deep learning-based AMD detection and staging in real-world OCT datasets (PINNACLE study report 5)
Leingang O, Riedl S, Mai J, Reiter GS, Faustmann G, Fuchs P, Scholl HPN, Sivaprasad S, Rueckert D, Lotery A, Schmidt-Erfurth U, Bogunovic H.
Sci Rep 13, 19545 (2023). DOI: 10.1038/s41598-023-46626-7

Comparison of choroidal thickness in eyes of diabetic patients with eyes of healthy individuals using optical coherence tomography in a tertiary care hospital
Hassan H, Cheema A, Tahir MA, Nawaz HN.
Pakistan Journal of Medical Sciences, 38(1), 2021. PMID: 35035435
DOI: 10.12669/pjms.38.1.4443

Comparison of the Effect of Ranibizumab and Aflibercept on Changes in Macular Choroidal Thickness in Patients Treated for Diabetic Macular Edema
Sarda V, Eymard P, Hrarat L, Fajnkuchen F, Giocanti-Aurégan A.
J Ophthalmol. 2020; 2020: 5708354. PMID: 32850142 DOI: 10.1155/2020/5708354

Choroidal thickness in diabetes and diabetic retinopathy: A swept source OCT study
Wang W, Liu S, Qiu Z, He M, Wang L, Li Y, Huang W.
Invest Ophthalmol Vis Sci. 2020;61:29.
PMCID: http://www.ncbi.nlm.nih.gov/pmc/articles/pmc7401852/ DOI: 10.1167/iovs.61.4.29

Distribution of Choroidal Thinning in High Myopia, Diabetes Mellitus, and Aging: A Swept-Source OCT Study
Bartol-Puyal FA, Isanta C, Ruiz-Moreno Ó, Abadia B, Calvo P, Pablo L.
J Ophthalmol. 2019; 2019: 3567813. PMID: 31511788 DOI: 10.1155/2019/3567813

Comparison of choroidal thickness in eyes of diabetic patients with eyes of healthy individuals using optical coherence tomography in a tertiary care hospital
Hassan H, Cheema A, Tahir MA, Nawaz HN.
Pakistan Journal of Medical Sciences, 38(1), 2021. PMID: 35035435
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Distribution of Choroidal Thinning in High Myopia, Diabetes Mellitus, and Aging: A Swept-Source OCT Study
Bartol-Puyal FA, Isanta C, Ruiz-Moreno Ó, Abadia B, Calvo P, Pablo L.
J Ophthalmol. 2019; 2019: 3567813. PMID: 31511788 DOI: 10.1155/2019/3567813

Choroidal vascularity index in type-2 diabetes analyzed by swept-source optical coherence tomography
Kim M, Ha MJ, Choi SY, Park YH.
Sci Rep. 2018;8:70. DOI: 10.1038/s41598-017-18511-7. PMID: 29311618; PMCID: PMC5758605

Choroidal thickness changes in non-treated eyes of patients with diabetes: Swept-source optical coherence tomography study
Horváth H, Kovács I, Sándor GL, Czakó C, Mallár K, Récsán Z, Somogyi A, Nagy ZZ, Ecsedy M.
Acta Diabetol. 2018;55:927–934. DOI: 10.1007/s00592-018-1169-0

AGE-RELATED MACULAR DEGENERATION

Peer-Reviewed Publications

Faricimab in neovascular AMD: first report of real-world outcomes in an independent retina clinic

AUTHORS: Stanga PE, Valentin-Bravo FJ, Stanga SEF, Reinstein UI, Pastor-Idoate S, Downes SM.

PUBLICATION: Eye(2023) 37:3282-3289; PMID: 36959312 DOI: 10.1038/s41433-023-02505-z

STUDY PURPOSE

Present week four clinical outcomes from a real-world study in an independent specialized retina clinic to assess the safety, efficacy, and durability of faricimab administered as customized treatment in patients with nAMD.

OVERVIEW

STUDY DESIGN

Observational, retrospective

STUDY DEVICE(S)

- DRI Triton SS-OCT (Topcon, Tokyo, Japan)
- Optos California, Silverstone (Optos PLC; Dunfermline, Scotland, United Kingdom)

OF EYES/PATIENTS

- 11 eyes from 9 patients

OUTCOME MEASURES

- Anatomical and functional features at baseline and 1 month after faricimab intravitreal injection

RESULTS

- At one month following the first faricimab intravitreal injection, four eyes (36.36%) gained at least one line of vision, six eyes (54.54%) remained stable, and one eye (9.09%) lost one line of vision.
- Overall average CRT at baseline was 565.41 +/- 391.38 µm which improved significantly to 326.97 +/- 226.48 µm at one month.
- PEDs were present in eight eyes (72.72%) at the initial examination and morphology changes such as flattening were observed in all of them 1 month after the first faricimab injection (Figure).

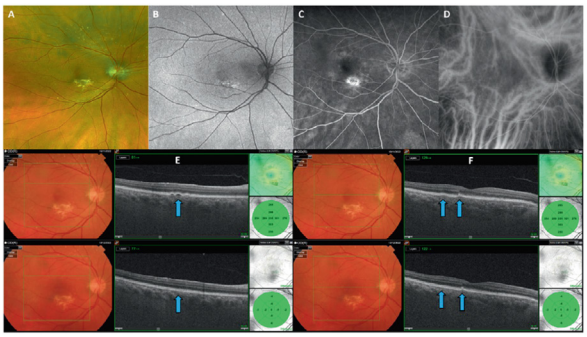

FIGURE. Resolution of multiple PEDs after the first faricimab intravitreal injection. Case 9: Patient diagnosed with nAMD using multimodal and simultaneous imaging including UWF RG (A), FAF (B), FFA (C) and ICGA (D), with navigated SS-OCT. In E and F, a resolution of multiple PEDs was observed after the first injection of faricimab (blue arrows)
Adapted from Eye(2023) 37:3282-3289; PMID: 36959312 DOI: 10.1038/s41433-023-02505-z

CONCLUSIONS

- Real-world results with faricimab in terms of improvement of BCVA and resolution of subretinal fluid or subretinal pigment epithelium haemorrhage are similar or even better when compared to other licensed anti-VEGF treatments at one month after the first injection.
- A way forward would be to identify the response therapy identifying specific OCT 'biomarkers' that will enable the identification of which treatment regimen is the most appropriate for each patient.
- A personalized medicine approach would be more cost –effective and reduce the number of appointments and IVI needed per year.
- Study limitations: Small sample size and short follow-up. Only 3 treatment naïve eyes

AGE-RELATED MACULAR DEGENERATION

Peer-Reviewed Publications Continued

Effects of Subthreshold nanosecond laser therapy in age-related macular degeneration using artificial intelligence (STAR-AI Study)

Hanna V, Oakley J, Russakoff D, Choudhry N.

PLoS ONE 16(4): e0250609, 2021. DOI: 10.1371/journal.pone.0250609

Vitrectomy with the inverted internal limiting membrane flap technique in eyes with full-thickness macular hole and dry age-related macular degeneration

Michalewska Z, Nawrocki J.

European Journal of Ophthalmology. 2021;31(3):1320-1325. PMID: 32345051
DOI: 10.1177/1120672120921376

MACULAR DISORDERS

Peer-Reviewed Publications

Macular Ganglion Cell Complex and Peripapillary Retinal Nerve Fiber Layer Thicknesses in Hydroxychloroquine Retinopathy

AUTHORS: Kim KE, Kim YH, Kim J, Ahn SJ.

PUBLICATION: Am J Ophthalmol. 2023 Jan;245:70-80. Epub 2022 Aug 11. PMID: 35963445. DOI: 10.1016/j.ajo.2022.07.028

STUDY PURPOSE

To investigate the macular ganglion cell complex (GCC) and peripapillary retinal nerve fiber layer (RNFL) thickness in patients with hydroxychloroquine retinopathy in differing severity.

OVERVIEW

STUDY DESIGN

Cross-sectional, case-control comparison

STUDY DEVICE(S)

- DRI Triton SS-OCT (Topcon, Tokyo, Japan)
- F-10 confocal scanning laser ophthalmoscope (Nidek)
- Ultra-widefield FAF (Optos PLC).
- Humphrey Field Analyzer II or III (Carl

OF EYES/PATIENTS

- 131 eyes with hydroxychloroquine retinopathy
- 132 matched controls
- All Korean patients.

OUTCOME MEASURES

- Macular GCC (macular RNFL, ganglion cell layer and inner plexiform layer)
- Peripapillary RNFL (pRNFL)
- 10-2 or 30-2 Humphrey standard

RESULTS

- Eyes with retinopathy presented with significantly thinner average GCC than those without retinopathy (P=0.009).
- The average and inferior pRNFL thicknesses were significantly lower in eyes with retinopathy than those without (P<0.05). On the clock-hour pRNFL thickness map, 9 and 10 cock-hour thickness along with the temporal pRNFL were significantly greater in eyes with retinopathy.
- Figure demonstrates the inner retinal changes along with visual field results for eyes with hydroxychloroquine retinopathy. Left shows more extensive hypoautofluorescence and photoreceptor defects (yellow arrows) than the right case; however, the VF defects are more remarkable in the right case.
- Significant correlations between the perimetric parameters and the average macular GCC thickness were seen in eyes with retinopathy (all P<0.001).

CONCLUSIONS

- Inner retinal changes might not be clinically significant at earlier stages, regardless of drug duration or cumulative dose.
- Careful investigation and monitoring of inner retinal changes in eyes with advanced hydroxychloroquine retinopathy should be performed, as this may contribute to structural degeneration in the whole retina and functional deterioration that cannot be accounted for by outer retinal damage only.

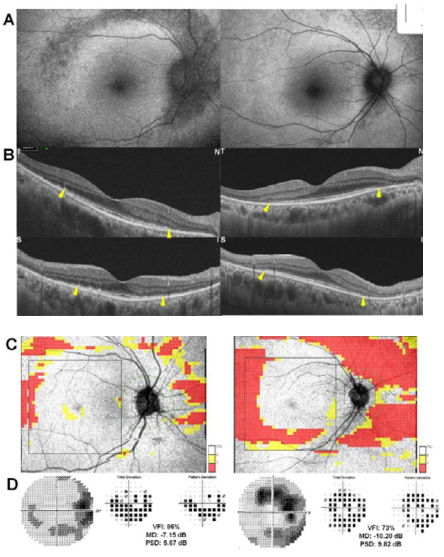

FIGURE. Photographic examples showing discrepancy in outer retinal damage on (A) fundus autofluorescence and (B) optical coherence tomography (OCT) B-scans with (C) inner retinal thinning on a thickness deviation map and (D) visual field defects. Adapted from Am J Ophthalmol. 2023 Jan;245:70-80. Epub 2022 Aug 11. PMID: 35963445. DOI: 10.1016/j.ajo.2022.07.028.

Topographic patterns of retinal edema in eyes with branch retinal vein occlusion and their association with macular edema recurrence

AUTHORS: Park HM, Kim YH, Lee BR, Ahn SJ.

PUBLICATION: Sci Rep 11, 23249 (2021). DOI: 10.1038/s41598-021-02726-w

STUDY PURPOSE

Address the clinical implication of novel imaging technique for evaluating macular edema (ME) secondary to branch retinal vein occlusion (BRVO)

OVERVIEW

STUDY DESIGN

Retrospective

STUDY DEVICE(S)

- DRI Triton SS-OCT (Topcon, Tokyo, Japan)

 # OF EYES/PATIENTS

- 87 eyes of 87 treatment naïve patients

OUTCOME MEASURES

- Topographic pattern of retinal edema
- Retinal thickness
- Rate of recurrence of ME after treatment
- Subtype of BRVO: Major – occlusion of temporal arcade vein or branch extending to peripheral retinal beyond the retinal vascular arcades. Macular – occlusion confined between the superior and inferior retinal temporal vascular arcades.

RESULTS

- Eyes with ME associated with BRVO included 49 and 38 eyes with superior and inferior RVO, respectively, and 37 and 50 eyes with macular and major BRVO, respectively.
- Only 12 eyes (13.8%) with ME had retinal edema confined within the ETDRS grid. Most with ME (75, 86.2%) had combined macular and extramacular edema.
- Edema patterns at 1 month after anti-VEGF therapy were significantly associated with the subtype of BRVO ($P<0.001$). Recurrence in the first 6 months following anti-VEGF therapy was significantly associated with the pattern. There were 95.2% of patients with combined residual edema, whereas 50% had residual edema in the extramacular area only and 22.2% without residual edema had ME recurrence.
- Residual edema were mostly wedge-shaped and commonly located between the fovea and the site of vascular occlusion.

CONCLUSIONS

- Residual edema following initial anti-VEGF therapy in the macular and extramacular areas, which could be identified using a widefield retinal thickness map, was significantly associated with recurrence of ME.
- The authors stated that their results highlight the clinical usefulness of topographic analysis of retinal edema for the prediction of ME recurrence in patients with BRVO.
- Monitoring and prediction of ME recurrence is important for long-term management of BRVO.
- OCT is one of the most important imaging modalities for the evaluation and management of BRVO. It provides qualitative and quantitative assessments of the macula and, as a result, it is used extensively for the detection of BRVO-associated ME.

MACULAR DISORDERS

Peer-Reviewed Publications Continued

Inter- and intra-observer agreement in the measurement of macular holes by optical coherence tomography
Gil-Hernández I, Vidal-Oliver L, Alarcón-Correcher F, López-Montero A, García-Ibor F, Ruiz-Del Río N, Duch-Samper A.
Arch Soc Esp Oftalmol (Engl Ed). 2023 Nov;98(11):614-618. Epub 2023 Aug 16.
PMID: 37595795 DOI: 10.1016/j.oftale.2023.07.003

The Role of ACE, ACE2, and AGTR2 Polymorphisms in COVID-19 Severity and the Presence of COVID-19-Related Retinopathy
Jevnikar K, Lapajne L, Petrovič D, Meglič A, Logar M, Vidovič Valentinčič N, Globočnik Petrovič M, Cilenšek I, Mekjavić PJ.
Genes 2022, 13(7), 1111. PMID: 35885894 DOI: 10.3390/genes13071111

Multimodal imaging of eyes with metamorphopsia after vitrectomy for rhegmatogenous retinal detachment
Kumar V, Naik A, Kumawat D, Sundar D, Chawla R, Chandra P, Kumar A.
Indian Journal of Ophthalmology 69(10):p 2757-2765, October 2021. PMID: 34571630
DOI: 10.4103/ijo.IJO_3658_20

Factors associated with serous retinal detachment in highly myopic eyes with inferior posterior staphyloma
Garcia-Ben A, González Gómez A, García Basterra I, García-Campos JM.
Archivos de la Sociedad Española de Oftalmología (English Edition), Volume 95, Issue 10, October 2020, Pages 478-484. PMID: 32561184. DOI: 10.1016/j.oftal.2020.05.013

Management of a case of myopic foveoschisis with phakic intraocular lens (pIOL) in situ: intraoperative challenges
Kumar A, Mehta A, Ravani RD, Kakkar P.
BMJ Case Rep. 2017 Apr 20:2017. PMID: 28432184 DOI: 10.1136/bcr-2016-218224

DURATION OF PRONE POSITIONING AFTER MACULAR HOLE SURGERY DETERMINED BY SWEPT-SOURCE OPTICAL COHERENCE TOMOGRAPHY
Sano M, Inoue M, Itoh Y, Kita Y, Hirota K, Koto T, Hirakata A.
Retina. 2017 Aug;37(8):1483-1491. PMID: 27849651. DOI: 10.1097/IAE.0000000000001394

CHOROIDAL DISORDERS

Peer-Reviewed Publications

Choroidal Thickness in Thyroid Eye Disease: Comparison With Controls and Application in Diagnosing Non-Inflammatory Active Disease

AUTHORS: Dave TV, Natarajan R, Reddy RU, Kapoor AG, Dave VP

PUBLICATION: Cureus 13(11): e19779. DOI: 10.7759/cureus.19779

STUDY PURPOSE

To report the differences in choroidal thickness in thyroid eye disease (TED) and normal and its discriminatory value for differentiating various stages of TED.

OVERVIEW

STUDY DESIGN

Prospective, cross-sectional

STUDY DEVICE(S)

- DRI Triton SS-OCT (Topcon, Tokyo, Japan)

OF EYES/PATIENTS

- 102 eyes of 51 patients

OUTCOME MEASURES

- Central choroidal thickness and ETDRS sub-fields analysis for normal controls (C), inactive TED (I), active TED (A), non-inflammatory active TED (NIA) and systemic disorder but no TED (SYS)

RESULTS

- The central subfoveal choroidal thickness was significantly higher in the A group and NIA group than in the other ones.
- For most of the ETDRS sub-fields choroidal thickness was significantly higher in the A and NIA group than in the C, I and SYS group.
- At the choroidal thickness value of >226 microns, the central sub-field had the strongest discriminatory potential to predict active TED with a sensitivity of 75% and a specificity of 86.5%.
- Age correlated negatively with choroidal thickness.
- The CAS (clinical activity score) was positively correlated with increasing choroidal thickness.

CONCLUSIONS

- This study showed that choroidal thickness was significantly higher in active TED and non-inflammatory active TED as compared to other groups (C, I, SYS).
- Choroidal thickness may be of value in differentiating non-inflammatory active TED from inactive eyes, esp. as NIA eyes may not show clinical signs of activity and may have a low CAS.

CHOROIDAL DISORDERS

Peer-Reviewed Publications Continued

Choroidal Vascularity Index versus Choroidal Thickness as Biomarkers of Acute Central Serous Chorioretinopathy
Ruiz-Moreno JM, Gutiérrez-Bonet R, Chandra A, Vupparaboina KK, Chhablani J, Ruiz-Medrano J.
Ophthalmic Res 20 December 2023; 66 (1): 627–635. DOI: 10.1159/000529474

Swept source optical coherence tomography analysis of choroidal thickness in macular telangiectasia type 2: a case-control study
Kumar V, Kumawat D, Kumar P.
Graefes Arch Clin Exp Ophthalmol 257, 567–573 (2019). PMID: 30560414
DOI: 10.1007/s00417-018-04215-9

OPTIC NERVE DISORDERS

Peer-Reviewed Publications

Comparison of Spectral-Domain OCT versus Swept-Source OCT for the Detection of Deep Optic Disc Drusen

Rothenbuehler SP, Malmqvist L, Belmouhand M, Bjerager J, Maloca PM, Larsen M, Hamann S.

Diagnostics 2022, 12, 2512. PMID: 36292204 DOI: 10.3390/diagnostics12102515

UVEITIS SPECTRUM DISORDERS

Peer-Reviewed Publications

Semi-automated quantitative analysis of the middle limiting membrane in tubercular serpiginous-like choroiditis using swept-source optical coherence tomography

Agarwal, A., Kalra, G., Agrawal, R. et al.

Sci Rep 11, 23493 (2021). DOI: 10.1038/s41598-021-02894-9

RETINOPATHY OF PREMATURITY

Peer-Reviewed Publications

Choroidal Thickness with Swept-Source Optical Coherence Tomography versus Foveal Morphology in Young Children with a History of Prematurity
Bowl W, Bowl M, Schweinfurth S, Holve K, Andrassi-Darida M, Stieger K, Lorenz B.
Ophthalmic Res. 2018;60(4):205-213. PMID: 29414835 DOI: 10.1159/000484631

Swept-source optical coherence tomography findings in premature children with a history of retinopathy of prematurity at 5 years of age
Celik G, Gunay M, Kizilay O.
Arq Bras Oftalmol. 2020 Nov-Dec;83(6):490-496. PMID: 33470276
DOI: 10.5935/0004-2749.20200090

CATARACT SURGERY

Peer-Reviewed Publications

Changes in subfoveal choroidal thickness after uncomplicated cataract surgery
Gudauskiene G, Matuleviciute I, Mockute R, Maciulaityte E, Zaliuniene D.
Biomed Pap Med Fac Univ Palacky Olomouc Czech Repub. 2019, 163(2):179-183.
PMID: 30565567 DOI: 10.5507/bp.2018.076

Associations between visual function and ultrastructure of the macula and optic disc after childhood cataract surgery
Hansen MM, Bach Holm D, Kessel L.
Acta Ophthalmol. 2022 Sep;100(6):640-647. Epub 2021 Nov 16. PMID: 34786847
DOI: 10.1111/aos.15065

NEUROLOGIC AND NEURODEGENERATIVE DISORDERS

Peer-Reviewed Publications

Early diagnosis of multiple sclerosis by OCT analysis using Cohen's d method and a neural network as classifier

AUTHORS: Garcia-Martin E, Ortiz M, Boquete L, Sánchez-Morla EM, Barea R, Cavaliere C, Vilades E, Orduna E, Rodrigo MJ.

PUBLICATION: Computers in Biology and Medicine 129, 2021. PMID: 33302162 DOI: 10.1016/j.compbiomed.2020.104165

STUDY PURPOSE

To diagnose early-stage multiple sclerosis (MS) patients based on analysis of retinal layer thickness obtained by swept-source OCT (SS-OCT)

OVERVIEW

STUDY DESIGN

Cross-sectional single center study

STUDY DEVICE(S)

- DRI Triton SS-OCT (Topcon, Tokyo, Japan)

OF EYES/PATIENTS

- Forty-eight eyes from 48 patients diagnosed with relapsing-remitting multiple sclerosis(RRMS). Forty-eight eyes from 48 healthy normal aged matched.

OUTCOME MEASURES

- Determination of which zones in a 45x60 point grid differentiate the best between patient recordings and control subject recordings for the layers: RNFL, GCL+, GCL++, and full retina.

RESULTS

- In all ocular layers analyzed, MS patients present lower thicknesses than controls.
- The points selected in the GCL++ layer constitute 44.99% of the total macula, with points located in the area of the papillomacular bundle being the most numerous.
- In the Retina, RNFL and GCL++ layers, an area with a higher density of discriminant points is detected in the inferonasal sector of the Macular area. (Figure)
- Feed-forward network of 689 inputs showed the best results with a sensitivity = specificity = 0.98.

CONCLUSIONS

- The retinal layers evaluated in this study exhibited thinning, showing a horseshoe-like (or U zone) topographical distribution.
- GCL++ turns out to be the most extensively affected layer with the highest number of discriminant points (44.99%).
- The automatic segmentation of GCL++ from Triton would be the result of manual combination of RNFL and G CIPL from Spectralis.
- The affectation of the ganglion cells is detected in the earlier stages of the disease and with shorter duration, absence of optic neuritis (ON) and lower expanded disability status scale (EDSS) values.
- This study identifies the neuroretinal affectation of GCL++ as the first and more discriminant retinal layer in early-stage MS patients (disease duration < 9 months from initial symptoms).

Functional Evaluation of the Visual Pathway in Patients with Multiple Sclerosis Using a Multifunction Stimulator Monitor

AUTHORS: Satue M, Jarauta L, Obis J, Cipres M, Rodrigo MJ, Almarcegui C, Dolz I, Ara JR, Martin J, Pablo LE, Garcia-Martin E.

PUBLICATION: Ophthalmol. 2019 Sep 18;2019:2890193. PMID: 31641531 DOI: 10.1155/2019/2890193

STUDY PURPOSE

To analyze the correlation between the functional measurements obtained and retinal structural parameters measured with swept-source optical coherence tomography (SS-OCT) in patients with multiple sclerosis (MS).

OVERVIEW

STUDY DESIGN

Observational, cross-sectional study

STUDY DEVICE(S)

- DRI Triton SS-OCT (Topcon, Tokyo, Japan)
- Monpack One (Metrovision, France)

OF EYES/PATIENTS

- Forty-eight eyes of 48 patients with relapsing-remitting MS (RRMS) and 46 eyes of 46 healthy individuals.

OUTCOME MEASURES

- Visual function, GCL in 6 peripapillary sectors, visual acuity (VA), contrast sensitivity vision (CSV), visual field, multifocal PEV and pattern ERG.

RESULTS

- Mean age of patients with RRMS and the mean age of controls were 49.25 + 12.98 years and 45.74 + 10.52 years, respectively.
- Patients with MS presented reduced low-contrast VA (0.43+0.50 in patients vs. 0.08+0.27 in controls $p<0.001$).
- CSV was found to be reduced in MS patients at all spatial frequencies.
- All visual field parameters were found to be altered in MS patients compared to controls.
- Patients with MS presented with delayed latency in all waveforms of the pattern ERG, however it was not significantly different.
- Patients presented significantly reduced macular retinal thickness ($p<0.001$) in all evaluated ETDRS areas and reduced peripapillary GCL thickness ($p<0.001$) in all 6 sectors analyzed compared to controls.

CONCLUSIONS

- The MS patients presented significant alterations in all visual field parameters compared with healthy controls.
- The authors state that this is the first study assessing the correlation between visual function parameters obtained with a multifunction simulator device and SS-OCT technology.
- Contrast sensitivity parameters and visual field data correlated most significantly with macular and peripapillary measurements.
- More studies are needed to corroborate the findings.

Ability of Swept-Source Optical Coherence Tomography to Detect Retinal and Choroidal Changes in Patients with Multiple Sclerosis

AUTHORS: Garcia-Martin E, Jarauta L, Vilades E, Ara JR, Martin J, Polo V, Larrosa JM, Pablo LE, Satue M.

PUBLICATION: Ophthalmol. 2018 Nov 13;2018:7361212. PMID: 30538857 DOI: 10.1155/2018/7361212

STUDY PURPOSE

To evaluate the ability of swept-source-OCY (SS-OCT) technology to detect changes in retinal and choroidal thickness in patients with multiple sclerosis (MS).

OVERVIEW

STUDY DESIGN

Observational, cross-sectional

STUDY DEVICE(S)

- DRI Triton SS-OCT (Topcon, Tokyo, Japan)

OF EYES/PATIENTS

- Ninety-seven eyes of 97 relapsing-remitting multiple sclerosis(RRMS) and 101 eyes of 1010 healthy individuals.

OUTCOME MEASURES

- Macular (EDTRS, GCL+ and GCL++) and peripapillary (RNFL, GCL+, and GCL++) thickness. Choroidal thickness for both the macular (EDTRS) and peripapillary area (TSNIT).

RESULTS

- Mean age of RRMS patients and healthy individuals were 48.46 + 11.31 years and 47.58 + 9.37 years, respectively.
- Mean disease duration in the patients was 7.56 + 2.66 years.
- Measurements showed reduced retinal thickness in all macular ETDRS sectors with MS patients compared with controls (P<0.001).
- Macular volume was significantly reduced in patients (7.54mm3) than in controls (7.92mm3) (p<0.001).
- Significant peripapillary retinal and RNFL thinning was observed in all measured areas except in the nasal quadrant/sector (p<0.001).
- The GCL+ was found to be reduced in the nasal and temporal quadrants.
- The GCL+ was found to be reduced in the inferonasal and temporal sectors and in total thickness.
- The macular and peripapillary choroidal thickness in MS patients did not show any significant difference compared with healthy controls.
- The outer ring of the choroidal plexus was found to be significantly reduced in MS patients compared with controls (261.41µm in controls vs 254.46µm in patients p=0.038)

CONCLUSIONS

- Triton SS-OCT detected significant retinal thinning in all the ETDRS areas in our patients, as well as retinal and RNFL thinning in all sectors of the peripapillary measurement (except in the nasal quadrant/sector).
- The authors suggest that the fact that the nasal quadrant is affected only in the GCL+ in their patients may suggest that GCL measurements are a subtle marker for neurodegeneration than RNFL.
- SS-OCT device detects macular thinning and peripapillary retinal, RNFL, and GCL reduction in MS patients, providing increased and more detailed evaluation of the choroid in these patients.

Retinal and Choroidal Changes in Patients with Parkinson's Disease Detected by Swept-Source Optical Coherence Tomography

AUTHORS: Satue M, Obis J, Alarcia R, Orduna E, Rodrigo MJ, Vilades E, Gracia H, Otin S, Fuertes MI, Polo V, Larrosa JM, Pablo LE, Garcia-Martin E.

PUBLICATION: Current Eye Research, 43(1), 109–115, 2017. PMID: 29111842 DOI: 10.1080/02713683.2017.1370116

STUDY PURPOSE

To evaluate the retinal and choroidal thickness in patients with Parkinson's Disease (PD) using SS-OCT technology.

OVERVIEW

STUDY DESIGN

Observational, cross-sectional study

STUDY DEVICE(S)

- DRI Triton SS-OCT (Topcon, Tokyo, Japan)

OF EYES/PATIENTS

- Fifty eyes of 50 patients and 54 eyes of 54 healthy individuals.

OUTCOME MEASURES

- Macular (EDTRS, GCL+ and GCL++) and peripapillary (RNFL, GCL+, and GCL++) thickness. Choroidal thickness for both the macular (EDTRS) and peripapillary area (TSNIT).

RESULTS

- Full macular thickness measurements from the ETDRS protocol showed no significant differences between patients with PD and healthy subjects.
- GCL+ provided by the TSNIT macular area scan demonstrated significant lower values in the PD patients than healthy individuals in the superonasal (73.09µm in controls vs. 68.72µm, p=0.032), inferonasal (72.23 vs 68.72µm p=0.018) and inferior (68.14 vs. 64.77µm, p=0.021) sectors of the macular area.
- GCL++ showed significantly lower thicknesses in the inferonasal (120.04 vs 114.93µm, p=0.030) and inferior (107.76 vs. 102.29µm, p=0.013).
- Macular choroidal thickness was augmented especially in the inner nasal (205.27 vs. 250.23µm, p=0.015), inner inferior (213.34 vs. 252.86µm, , p=0.030), outer nasal (163.21 vs. 208.01 µm, p=0.012) and outer inferior (200.65 vs. 233.25 µm, p=0.049) ETDRS areas.
- Peripapillary choroidal thickness was found to be significantly augmented in PD patients in total thickness (125.20 vs. 152.85 µm, p = 0.011), the nasal (129.52 vs. 153.13 µm, p = 0.025), inferior (98.87 vs. 130.00 µm, p = 0.007), and temporal (128.12 vs.165.23 µm, p = 0.003) quadrants, and nasal (129.00 vs. 152.15 µm, p = 0.025), inferotemporal (94.55 vs. 131.45 µm, p = 0.003), inferonasal (99.86 vs. 126.85 µm, p = 0.016), and temporal (128.12 vs. 165.23 µm,p = 0.003) sectors, compared to controls.
- The rest of the peripapillary choroidal measurements demonstrated a tendency toward choroidal thickening in all areas.

CONCLUSIONS

- Patients presented a significant reduction of the GCL in the nasal and inferior sectors of the macular area, retinal thinning in the peripapillary areas especially affecting the temporal and superotempral sectors; RNFL and GCL++ loss was observed in the inferotemporal sector.

NEUROLOGIC AND NEURODEGENERATIVE DISORDERS

Peer-Reviewed Publications Continued

Computer-Aided Diagnosis of Multiple Sclerosis Using a Support Vector Machine and Optical Coherence Tomography Features
Cavaliere C, Vilades E, Alonso-Rodríguez MC, Rodrigo MJ, Pablo LE, Miguel JM, López-Guillén E, Morla EMS, Boquete L, Garcia-Martin E.
J Ophthalmol. 2018 Nov 13;2018:7361212. PMID: 31816925 DOI: 10.3390/s19235323

Swept source optical coherence tomography to early detect multiple sclerosis disease. The use of machine learning techniques
Pérez del Palomar A, Cegoñino J, Montolío A, Orduna E, Vilades E., et al.
PLOS ONE 14(5): e0216410, (2019). DOI: 10.1371/journal.pone.0216410

CHRONIC HEALTH CONDITIONS

Peer-Reviewed Publications

Ganglion cell layer thickening in patients suffering from Obstructive Sleep Apnea-Hypopnea syndrome with long Mean Apnea-Hypopnea Duration during sleep

Chalkiadaki E, Andreanos K, Karmiris E, Florou C, Tsiafaki X, Amfilochiou A, Georgalas I, Koutsandrea C, Papaconstantinou D.

Int Ophthalmol 41, 923–935 (2021). PMID: 33201446 DOI: 10.1007/s10792-020-01648-2

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